Quantel medical

SoLuTis

Selective Laser Trabeculoplasty

SERVICE MANUAL

XL SOL MT AN

CE 0459

Directive 93/42/EEC

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WARNINGS

WARRANTY: - Any adjusting and calibrating procedure described in this manual shall be performed only by Technicians previously trained by QUANTEL MEDICAL.

- Any faulty part will be replaced by a strictly identical one provided by QUANTEL MEDICAL.

- For safety reasons, QUANTEL MEDICAL considers any Laser module and electronic board as whole partial assembly:

  * Defective boards will be returned to QUANTEL MEDICAL for replacement
  * Warranty will not be applied if a Board has been damaged during an intervention or attempt to repair.

* The SOLUTIS partial assemblies are :

"LASER HEAD":
- **"ENERGYMETER assembly"**
- **"SHUTTER assembly"**
- **"TRIGGER assembly"**
- **"DISPLAY/KEYBOARD assembly"**
- **"AIMING LASER assembly"**

"LASER CONSOLE":
- **"HIGH VOLTAGE board"**
- **"INTERFACE board"**
- **"AUXILARY board"**
- **"CPU board"**
- **"HV CAPACITOR CONTROLLER board"**

Warranty will not be applied unless these recommendations are strictly respected.

WARRANTY VOID IF THE LASER CONSOLE AND LASER HEAD OPENED WITHOUT ADMISSION OF THE QUANTEL MEDICAL TECHNICAL DEPARTMENT

CAUTIONS: All technicians will carefully respect all the safety instructions described in this service manual.

WARNING: Special training by QUANTEL MEDICAL for technicians is necessary to ensure optimum adjustment and maximum reliability of the whole instrument.

WARNINGS

CLASSIFICATION:

This system is intended for continuous operation and has the following classification:

- Protective class: **I**
- Type: **BF**
- Protection degree: **IP20**
- Functionning mode: **Intermittent service** (300 shots max - 3 min rest)

LASER SAFETIES:

All staff using this laser system, or in charge of its maintenance, must be aware of the following basic precautions to be taken:

1- Never look straight to the beam or to any reflecting object able to reflect the beam.

2- Limit the laser room access to the requested personnel only, who is already aware of precautions to be taken.

3- The laser room must be indicated with the specially designed labels.

4- Never direct the laser beam towards an aperture.

5- Never expose any reflective object or shiny surface to the direct beam path.

IMPORTANT: After each use, switch off the instrument completly by turning the key to 'OFF' position.

WARNINGS: **HIGH VOLTAGE INSIDE THE UNIT**

- Laser power up to 2mJ at 532 nm and laser Aiming beam up to 1mW at 637 nm could be accessible upon removal of consol cover.

DO NOT remove cover unless instructed to do so by a factory-trained technician.

- Anyone in room during service or maintenance shall wear **PROTECTIVE SAFETY GOGGLES.**

Please check carefully these protective glasses are adequate for the type of laser used.

For the SOLUTIS:
- Protection: **OD5** at **532 nm**
- Reference (EN207): **D 180-532 L5**.

CAUTION: Use of controls or adjustments or performances other than those specified herein may result in hazardous radiation exposure.

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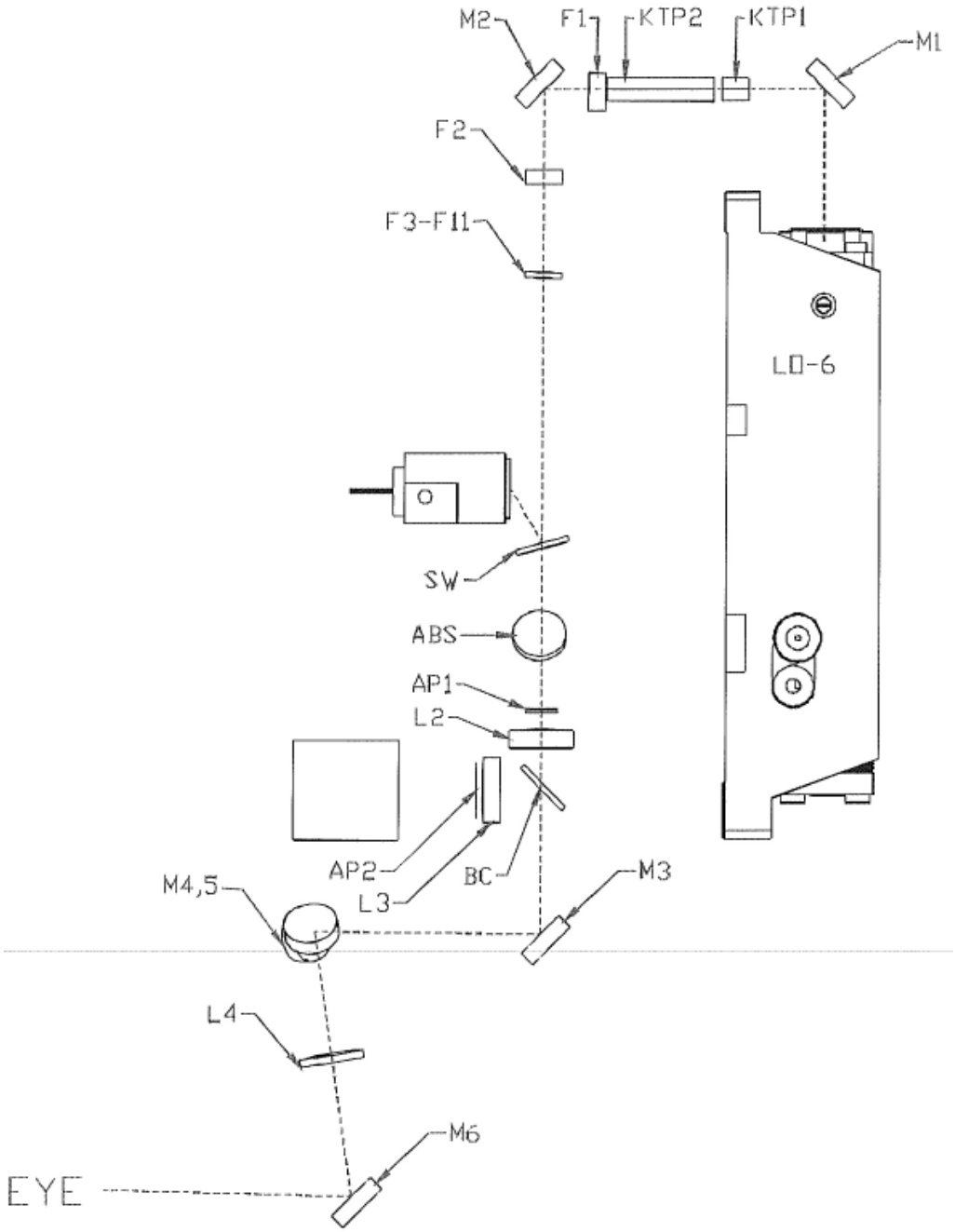
CHAPTER 1

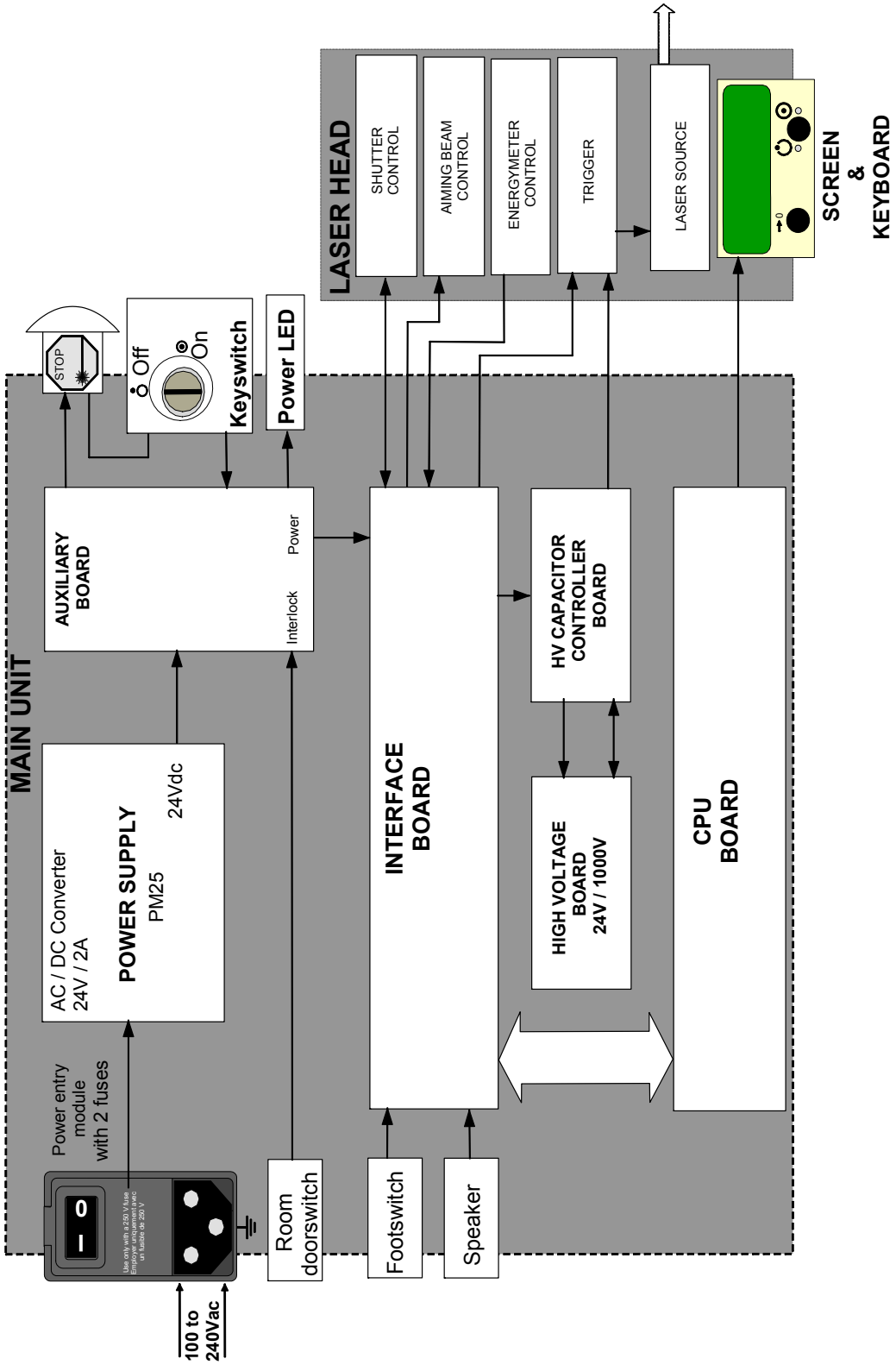
BLOCK AND WIRING DIAGRAMS

1 - BLOCK AND WIRING DIAGRAMS

1-1 OPTICAL BLOCK DIAGRAM



1-2 OVERALL BLOCK DIAGRAM



1 - BLOCK AND WIRING DIAGRAMS

1-3 DESCRIPTION OF THE SYSTEM

System is made of two main sub assemblies:

- LASER CONSOLE
- LASER HEAD

1-3-1 LASER CONSOLE

The LASER CONSOLE is a metal enclosure containing all of electronic control sub-units:

- MAINS POWER ENTRY / SWITCH / FUSE MODULE,
- AC/DC CONVERTER POWER SUPPLY,
- AUXILARY BOARD,
- INTERFACE BOARD,
- CPU BOARD,
- HV CAPACITOR CONTROLLER BOARD,
- HIGH VOLTAGE BOARD,
- BACK PANEL CONNECTORS.

1-3-1-1 MAINS POWER ENTRY / SWITCH / FUSE MODULE

There are two separate fuses:
one for Line and other for Neutral: **Fuses are 2AT/250V.**

1-3-1-2 AC/DC CONVERTER POWER SUPPLY (24V)

INPUT: 85 to 264 Vac
47 to 63 Hz
1,2A of maximum input current.

OUTPUT: 24Vdc
up to 40W with covered enclosure.

1-3-1-3 AUXILARY BOARD

The AUXILARY board distributes the electrical power from the POWER SUPPLY to the INTERFACE board and control the laser console front panel.

1-3-1-4 INTERFACE BOARD

The INTERFACE board (optocoupler interface) converts and distributes electric power to other boards and laser head.

Its main functions are:

- Power regulation: 5V voltage regulator.
  12V voltage regulator (aiming beam).
- Galvanic insulation: DC/DC power converter.
- Optocoupler insulation: Computer signals.
- Hardware control:
  - Footswitch,
  - High voltage,
  - Energymeter,
  - Shutter position,
  - Computer watch-dog.
- Speaker control.
- High voltage control.

1-3-1-5 CPU BOARD

CPU board is connected to INTERFACE board via two connectors:

- The first connector feeds all the digital and analog signals.
- The second connector is for CPU power supply.

The CPU board is the heart of the system:

- Display control.
- Control the HIGH VOLTAGE CAPACITOR via the INTERFACE board.
- Control the laser head via the INTERFACE board.

1-3-1-6 HV CAPACITOR CONTROLLER BOARD

HV CAPACITOR CONTROLLER board is connected to INTERFACE board and to HIGH VOLTAGE board.

The laser head flash lamp is supplied by this board.

The high voltage is checked by the CPU Board (safety detection).

1-3-1-7 BACK PANEL CONNECTORS

BACK PANEL CONNECTORS are:

- Mains input,
- Interlock,
- Footswitch,
- Signal and High voltage for laser head,
- GND terminal.

1-3-2 LASER HEAD

LASER HEAD is a metal enclosure containing all of optics and some electronic sub-units:

- TRIGGER BOARD
- SHUTTER MODULE
- ENERGYMETER BOARD
- AIMING BEAM MODULE
- DISPLAY / KEYBOARD MODULE
- LASER SOURCE
- OPTICAL MODULES

LASER CONSOLE and LASER HEAD are connected to each other with a cable through which all control signals and high voltage are transmited.

1-3-2-1 TRIGGER BOARD

The laser head flash lamp is powered by this trigger board which is controlled by the CPU board.

1-3-2-2 SHUTTER MODULE

Purpose of a safety shutter is to block the laser pulse when it is not wanted. Shutter is controlled by the CPU board via the INTERFACE board.
There are two position detections : - Shutter closed.
- Shutter opened.

1-3-2-3 ENERGYMETER BOARD

ENERGYMETER board measures the energy of each laser pulse.

The calibration is done at the max power level : - 2mJ with P1.

1-3-2-4 AIMING BEAM

A 1mW laser diode provides the 637nm wavelenght beam.
The beam intensity is set by the knurled potentiometer on the laser head right-hand side.

1-3-1-5 DISPLAY / KEYBOARD

DISPLAY/KEYBOARD module is connected directly to CPU board.

The back-light LED power is fed from INTERFACE board (5V).
The CPU controls through INTERFACE board the both front panel status LEDs (green for Stand-by and yellow for Ready) which are above STAND-BY / READY button.

There are two keys on the laser head front panel:
- COUNTER RESET button,
- STAND-BY / READY button.

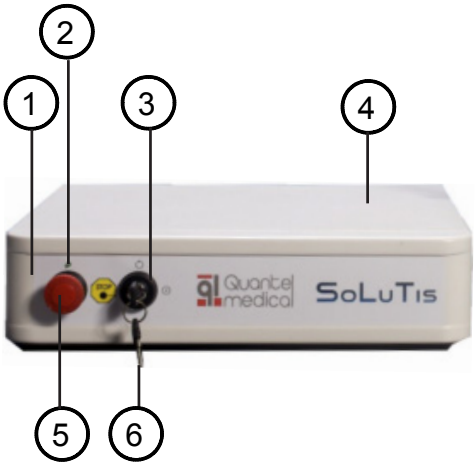
CHAPTER 2

ACCESORIES AND SPARE PARTS

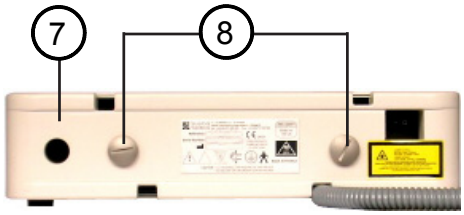
2 - ACCESSORIES AND SPARE PARTS

2-1 OVERALL VIEWS

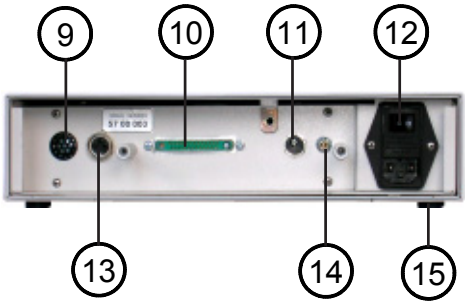
FRONT LASER CONSOLE

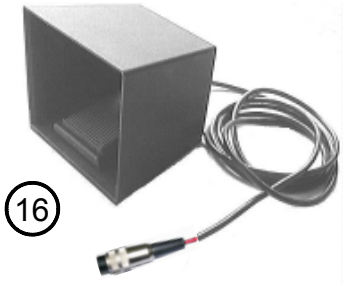


REAR LASER CONSOLE
(WITH REAR COVER)

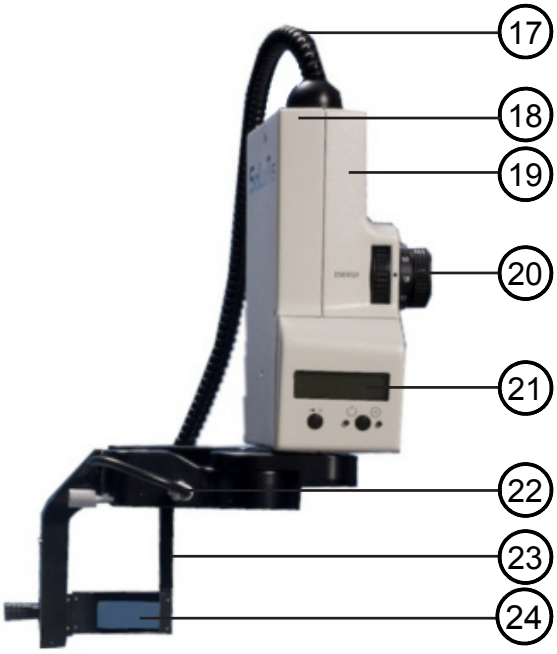


REAR LASER CONSOLE
(WITHOUT REAR COVER)



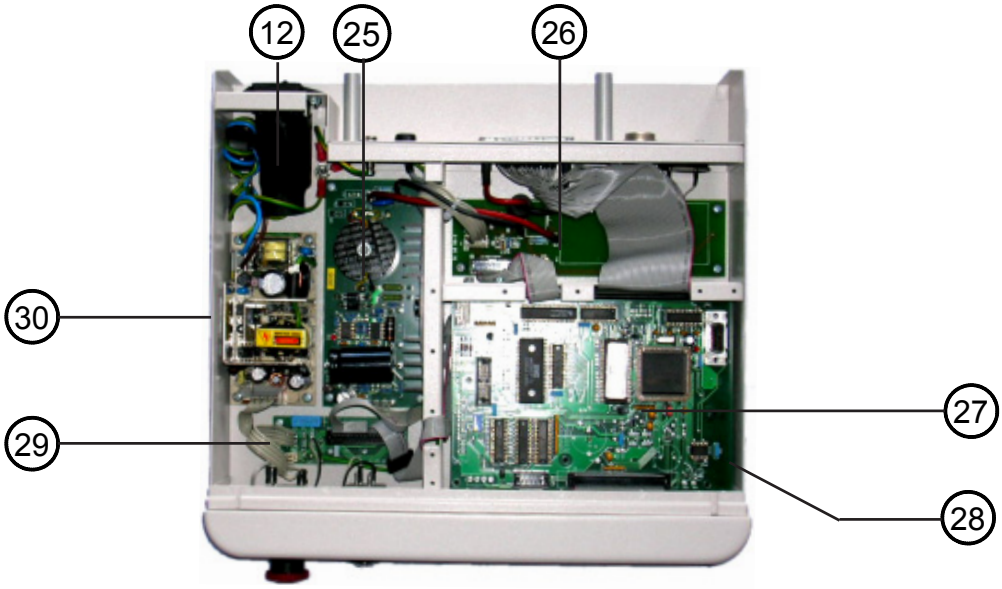


LASER HEAD
(Front view)

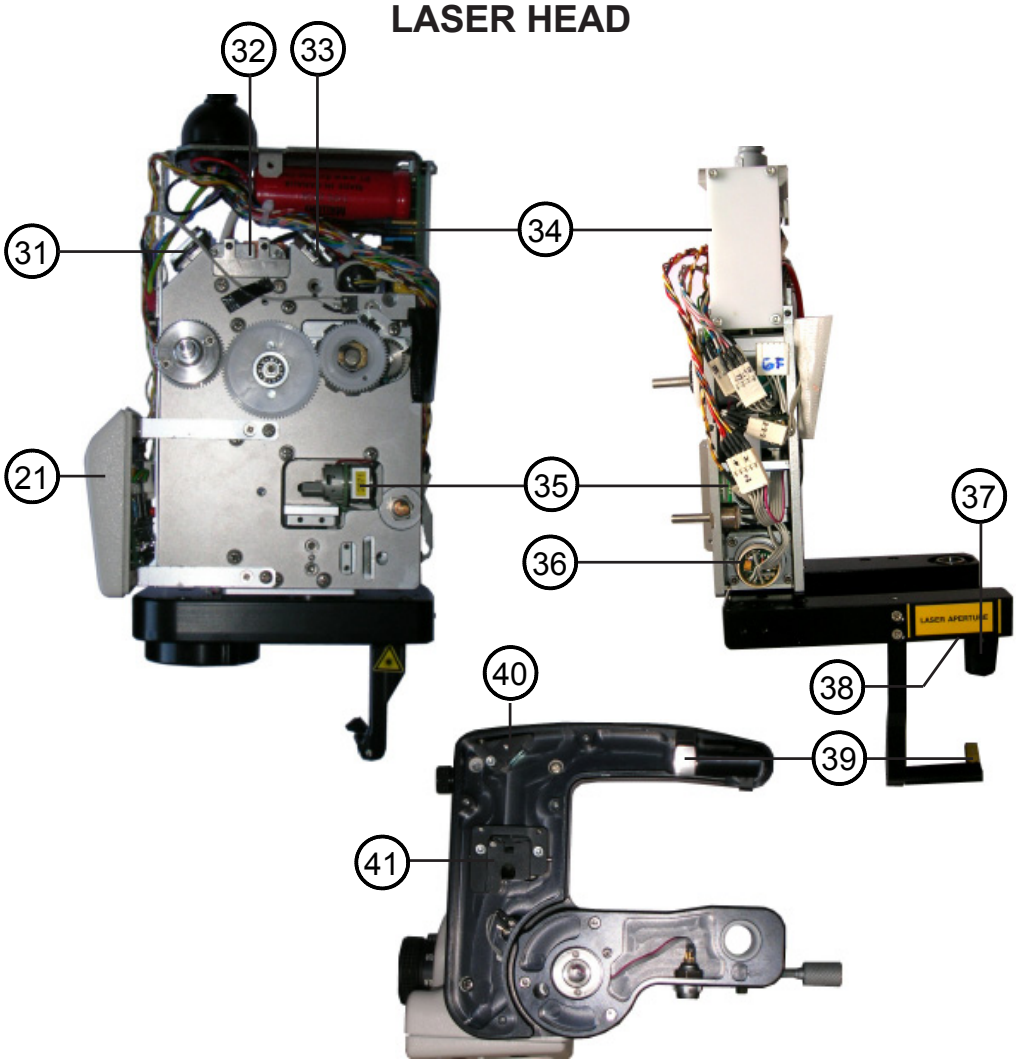


2-2 INNER VIEWS

LASER CONSOLE



LASER HEAD



2 - ACCESSORIES AND SPARE PARTS

2-2 SPARE PARTS

Marker	Idendification	Part Number
1	Laser console chassis	
2	LED	
3	Keyswitch	
4	Laser console cover	
5	Emergency stop button	
6	Keys (x2)	
7	Back cover	
8	Back cover fixing screws (x2)	
9	Speaker	
10	DB 25 pin connector	
11	Doorswitch connector	
12	Power entry module	
13	Footswitch connector	
14	Protyective earth connector	
15	Rubber feet (x4)	
16	Footswitch	
17	Head/console link cable	
18	Laser head left-hand cover	
19	Laser head right-hand cover	
20	Energy button	
21	Display/keyboard module	
22	Laser head holder	
23	Doctor filter holder	
24	Doctor filter	
25	High voltage board	

Marker	Idendification	Part Number
26	Capacitor controller board	
27	CPU board	
28	Interface board	
29	Auxilary board	
30	Power supply	
31	M1 mirror assembly	
32	KTP assembly	
33	M2 mirror assembly	
34	Trigger board	
35	Shutter	
36	Aiming beam module	
37	L4 lens assembly	
38	M5 mirrors	
39	M6 final mirror	
40	M4 mirror assembly	
41	M3 mirror assembly	

CHAPTER 3

SOLUTIS DISSAMBLING

3 - SOLUTIS DISASSEMBLING

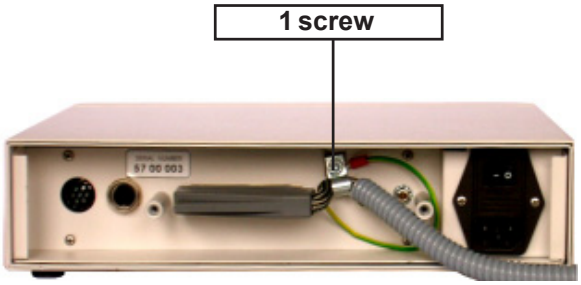
**WARRANTY VOID IF
THE LASER CONSOLE AND LASER HEAD OPENED
WITHOUT ADMISSION OF
THE QUANTEL MEDICAL TECHNICAL DEPARTMENT**

3-1 LASER CONSOLE COVER REMOVAL

- Unscrew the 2 screws on the back cover.

Unplug the mains cord and the footswitch cable at the SOLUTIS back.

- Unscrew the indicated screw.



- Slide the internal unit part by pushing the unit back.

3-2 LASER CONSOLE SUBSYSTEM LOCATION

The SOLUTIS laser console contains electronic boards and electrical systems:

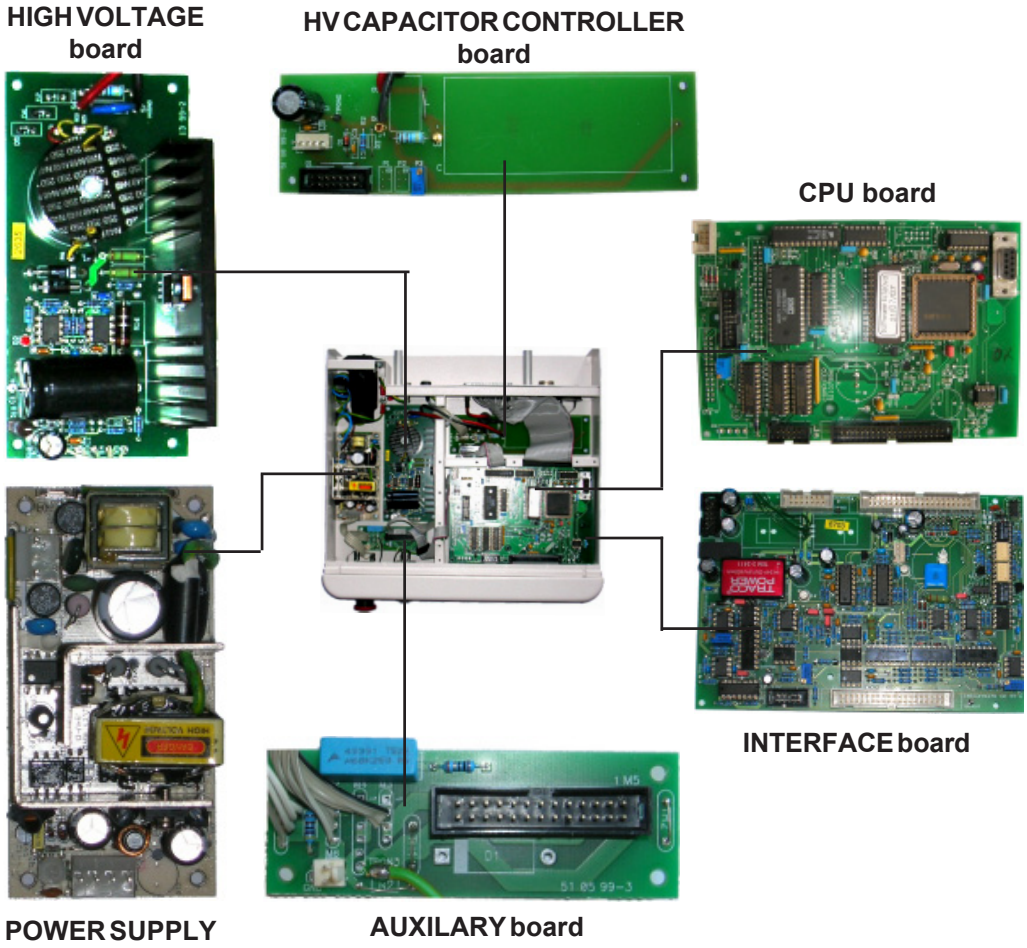
LASER CONSOLE

Electronic boards:

- AUXILARY board
- CPU board
- POWER SUPPLY
- INTERFACE board
- HIGH VOLTAGE board
- HV CAPACITOR CONTROLLER board

Electrical system:

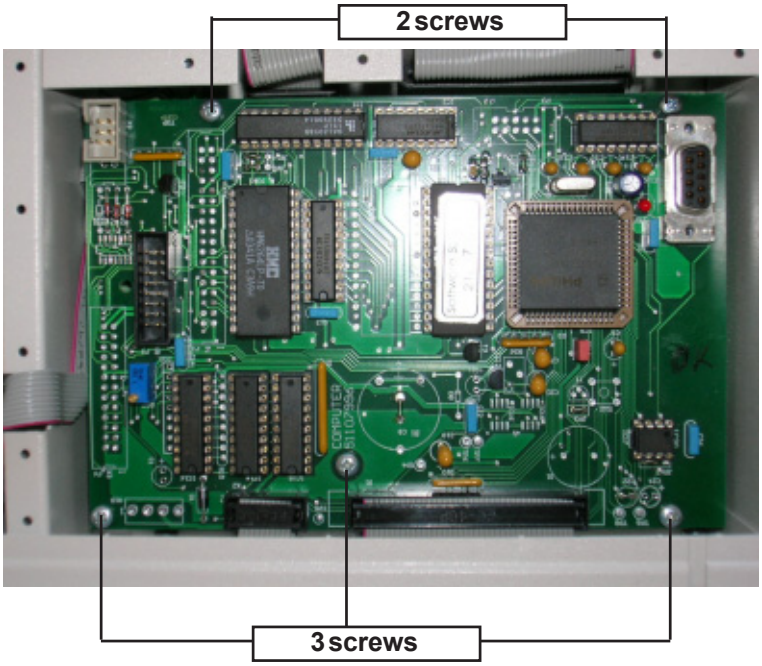
- Power entry module



3 - SOLUTIS DISASSEMBLING

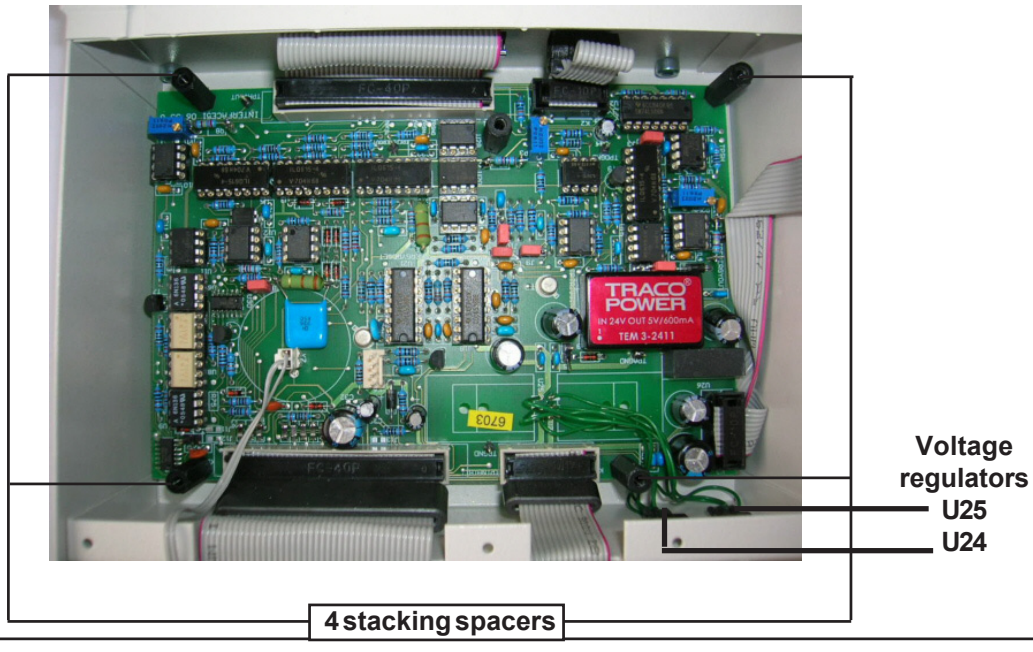
3-2-1 CPU BOARD

- Unplug all the cables.
- Unscrew the 5 screws indicated.



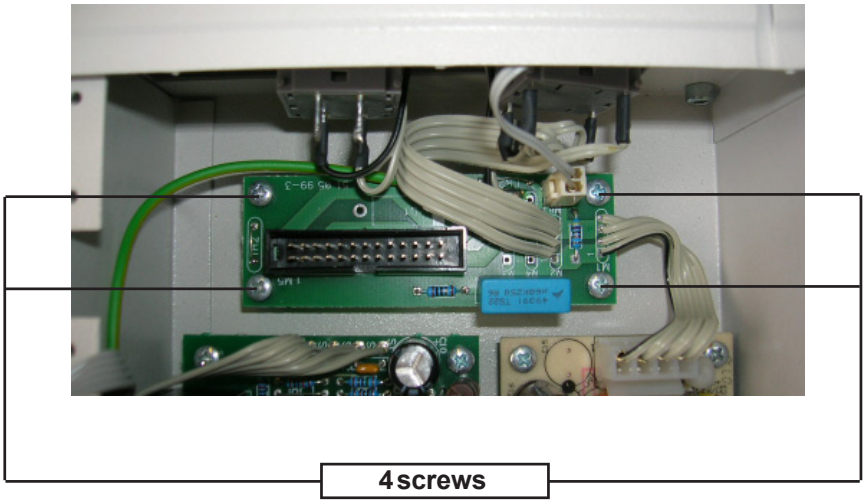
3-2-2 INTERFACE BOARD

The INTERFACE board is situated under the CPU board
- Unplug all the cables.
- Unscrew the 5 plastic stacking spacers.
- Unscrew the 2 bolts fixing the voltage regulators U24 and U25 on the chassis.



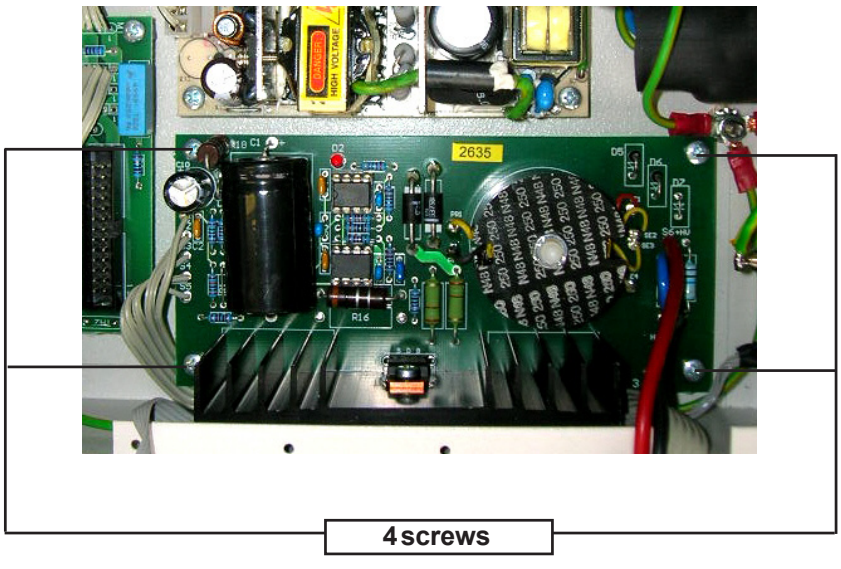
3-2-3 AUXILARY BOARD

- Unplug all the cables.
- With a screwdriver, unplug the keyswitch and stop button blocks.
- Unscrew the 4 screws indicated.



3-2-4 HIGH VOLTAGE BOARD

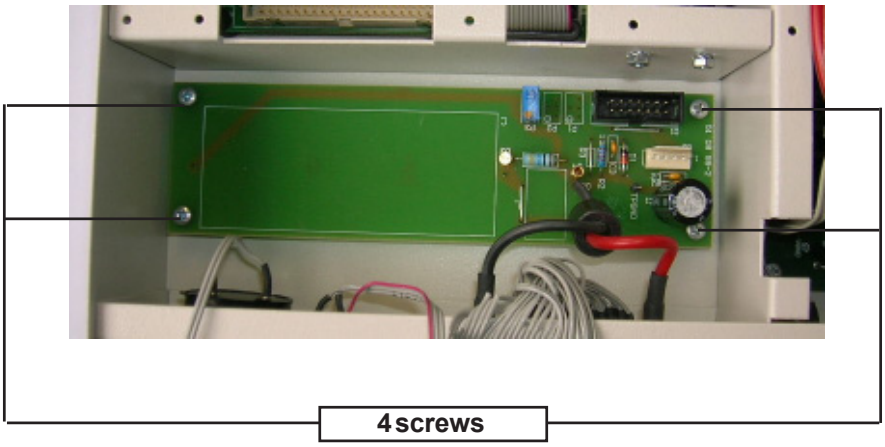
- Unplug all the cables.
- Unscrew the 4 screws indicated.



3 - SOLUTIS DISASSEMBLING

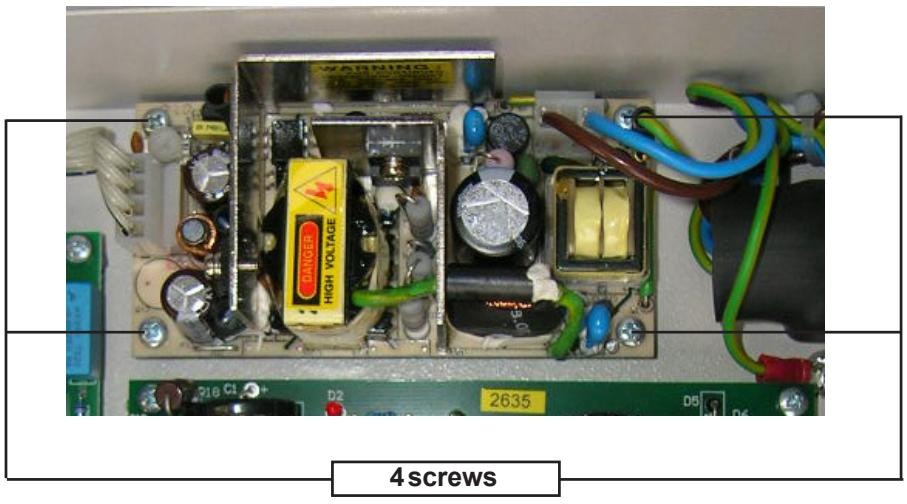
3-2-5 CAPACITOR BOARD

- Unplug all the cables.
- Remove the laser head connector.
- Unscrew the 4 screws indicated.



3-2-6 POWER SUPPLY

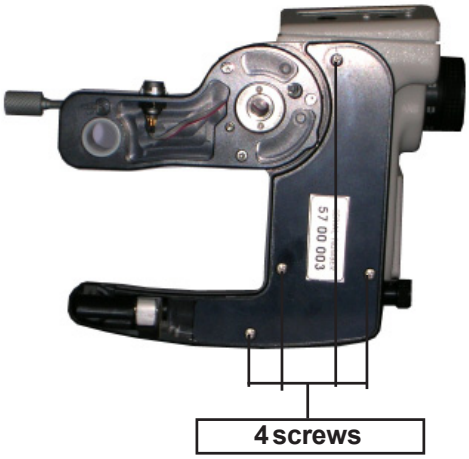
- Unplug all the cables.
- Unscrew the 4 screws indicated.



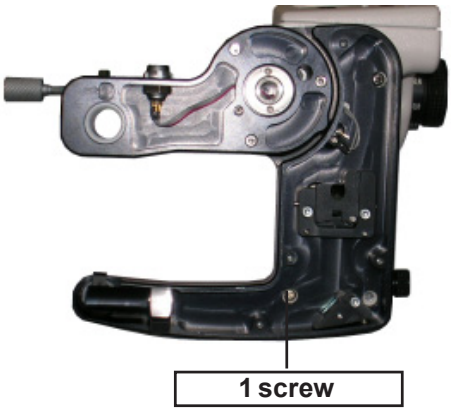
3-3 LASER HEAD COVER REMOVAL

3-3-1 LEFT-HAND COVER REMOVAL

- Unscrew the 4 screws on the bottom cover plate of the head laser holder.

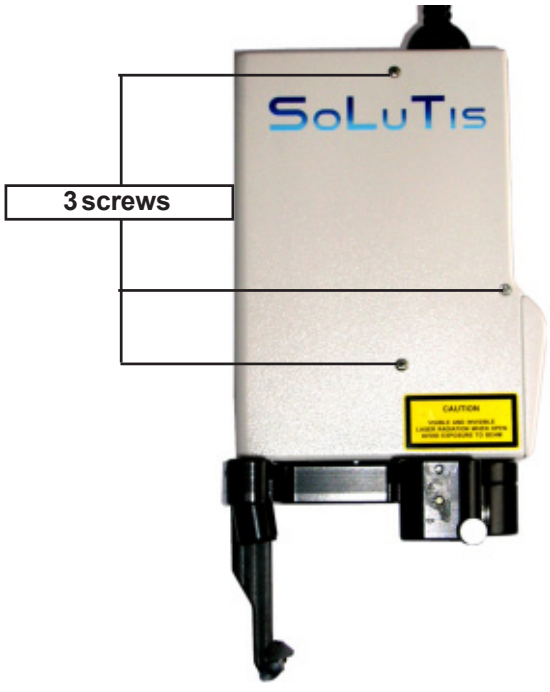


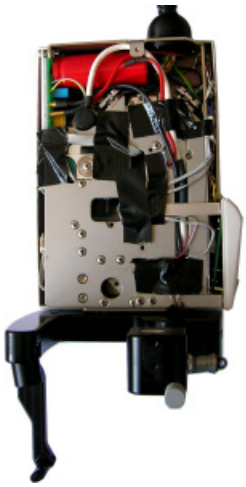
- Unscrew the screw through the head laser holder.



- Loosen the protection cable.

- Unscrew the 3 screws on the left cover.



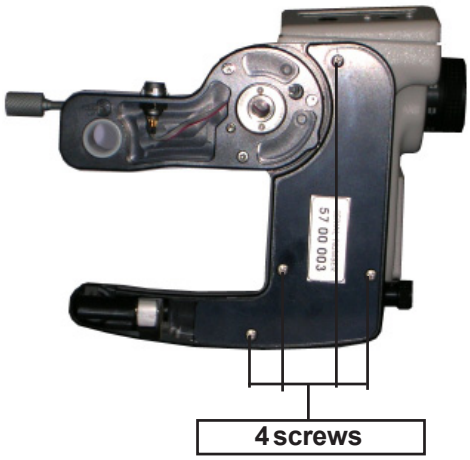


3 - SOLUTIS DISASSEMBLING

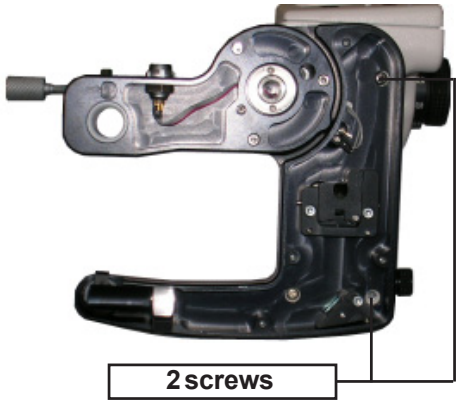
3-3-2 RIGHT-HAND COVER REMOVAL

To remove the right-hand cover, the left-hand cover must be remove at first.

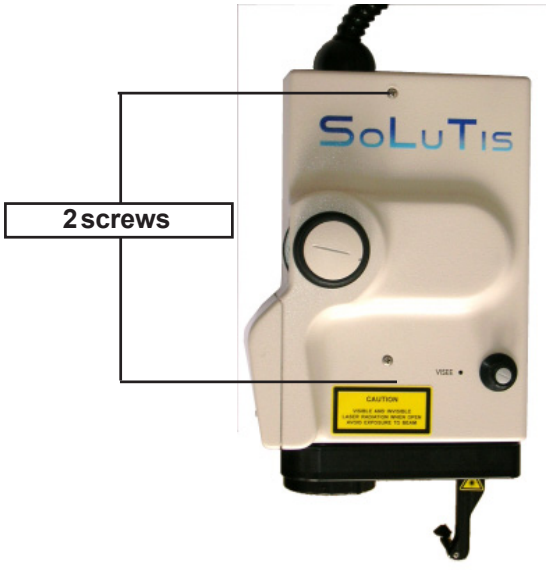
- Unscrew the 4 screws on the bottom cover plate of the head laser holder.



- Unscrew the 2 screws through the head laser holder.



- Unscrew the 2 screws on the left cover.

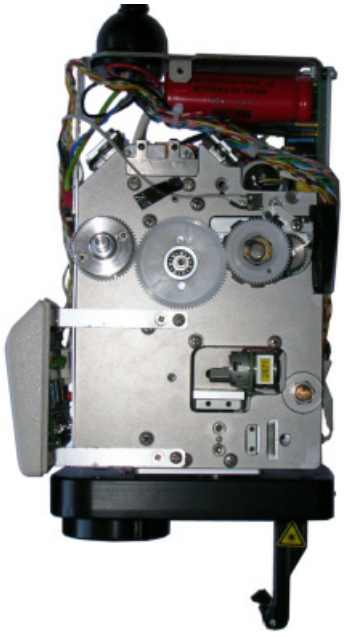


3 - SOLUTIS DISASSEMBLING

- Remove the ENERGY button rubber.

- Loose the screw in the ENERGY button.

- Loose the screw in the VISEE button.



3 - SOLUTIS DISASSEMBLING

3-4 LASER HEAD SUBSYSTEM LOCATION

LASER HEAD

Electronic boards:

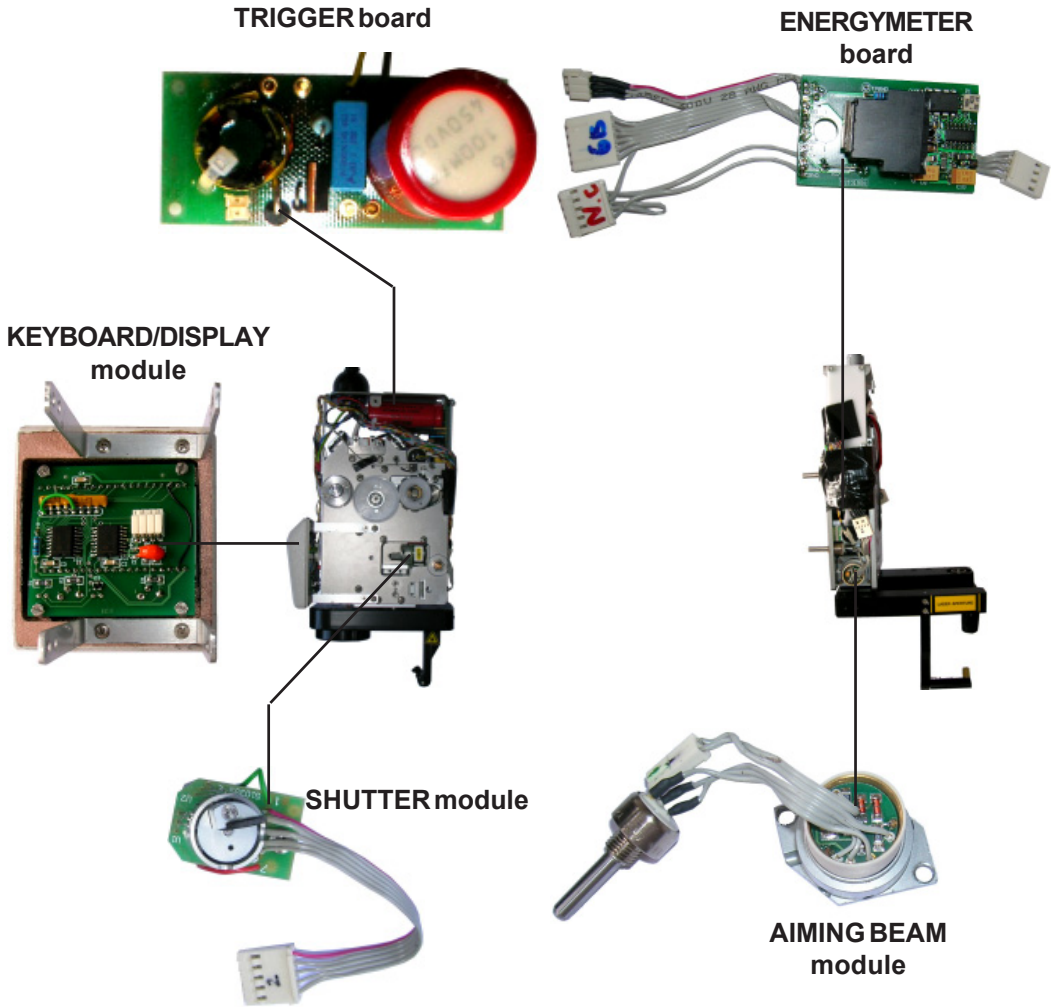
- KEYBOARD / DISPLAY board
- ENERGYMETER board
- TRIGGER board
- AIMING BEAM module

Optical system:

- LASER source

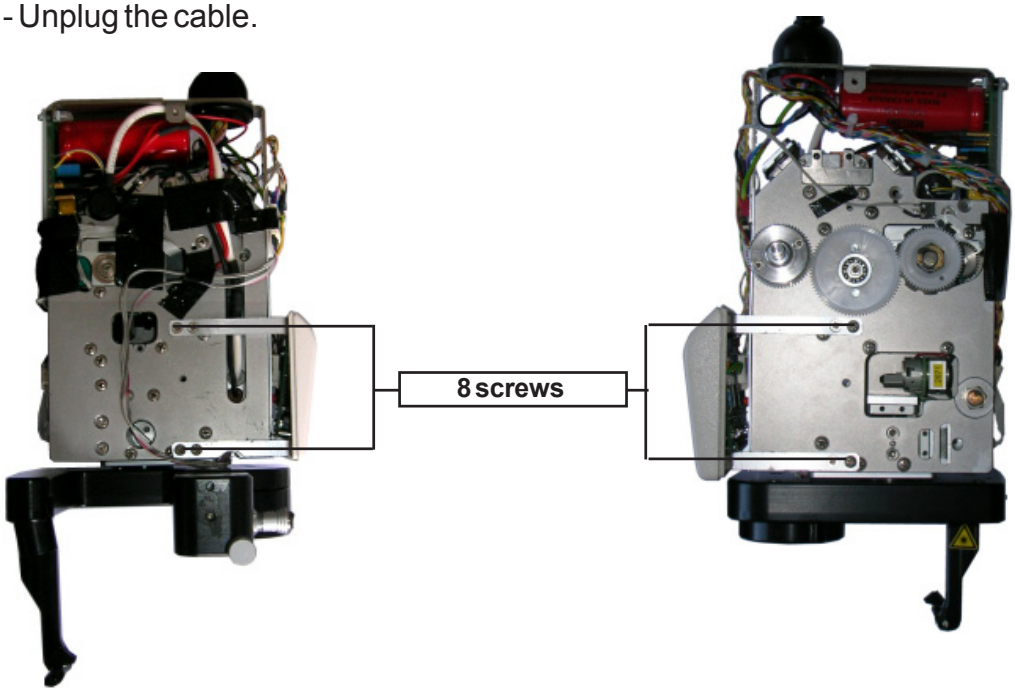
Electromechanical system:

- SHUTTER module

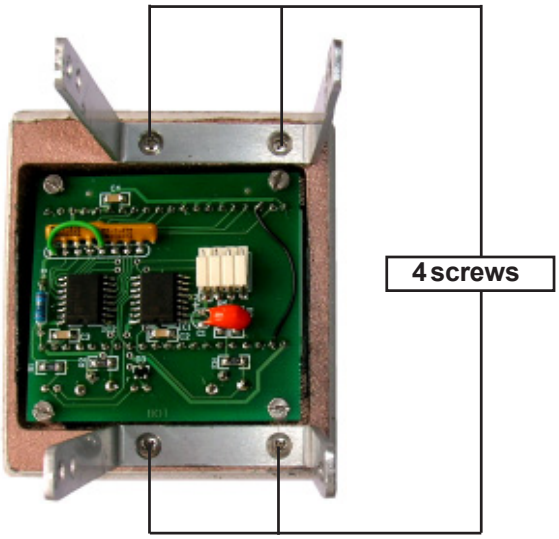


3-4-1 KEYBOARD/DISPLAY BOARD AND LCD

- Unscrew the 8 screws indicated on each laser head sides.
- Pull out the DISPLAY/KEYBOARD module.
- Unplug the cable.



- At the KEYBOARD/DISPLAY module back, Unscrew the 4 screws indicated taking care to the spacers between front face and board.

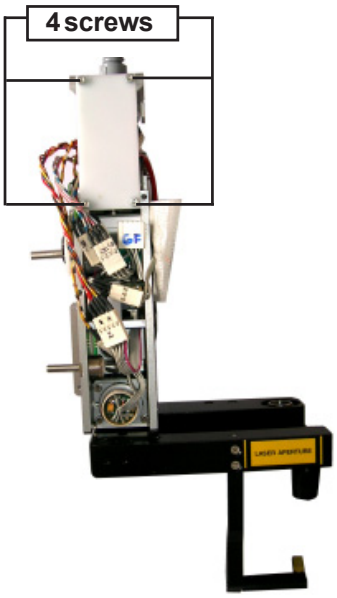


3 - SOLUTIS DISASSEMBLING

3-4-2 TRIGGER BOARD REMOVAL

The TRIGGER board is situated under the white plastic plate.

- Unscrew the 4 screws taking care to the 4 spacers between board and plastic plate.
Take care also to the 2 nuts with the 2 upper screws.

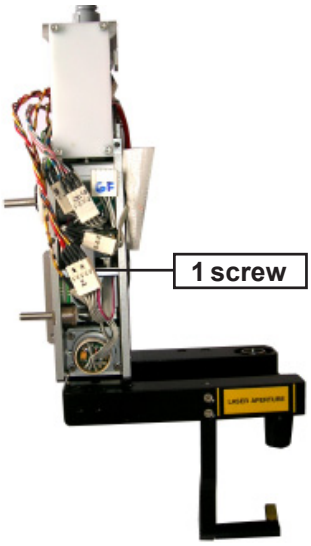


3-4-3 ENERGYMETER BOARD REMOVAL

- Unscrew the screw and remove it with the plastic piece keeping in place the energymeter board into the chassis.

-Pull out the board.

- Unplug all connectors.

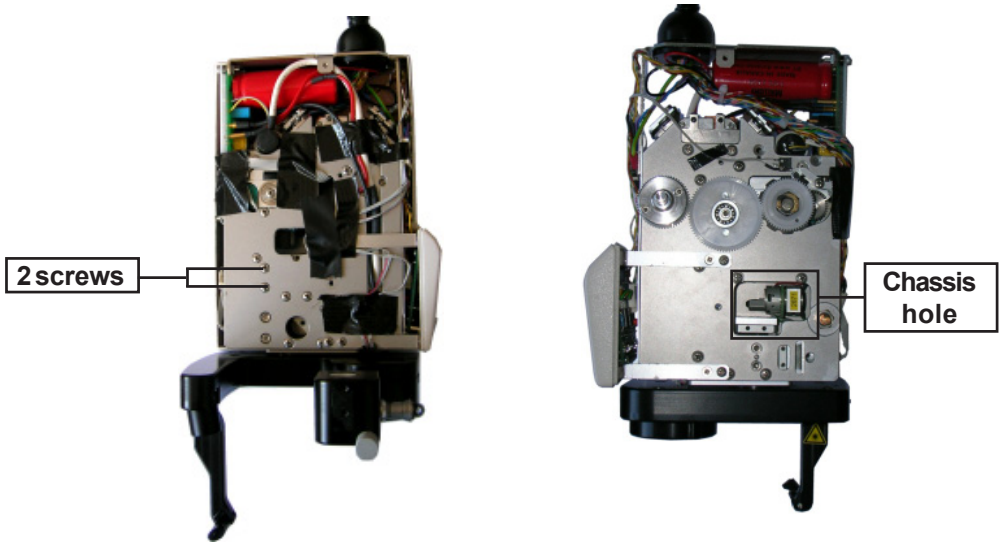


3-4-4 SHUTTER REMOVAL

- Unscrew the 2 screws indicated on the left-hand side.

- Unplug the connector.

- Remove the shutter module through the right-hand chassis hole.



3-4-5 AIMING BEAM MODULE REMOVAL

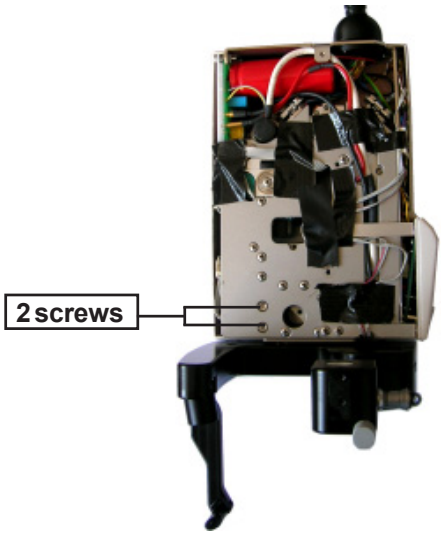
- Unscrew the 2 screws indicated on the left-hand board.

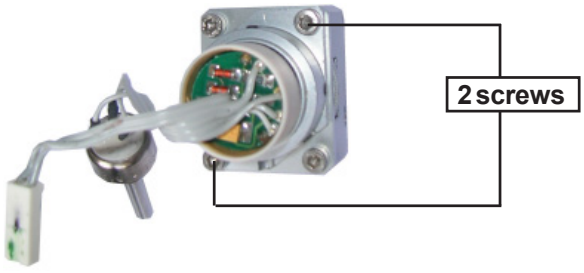
-Unscrew the potentiometer nut.

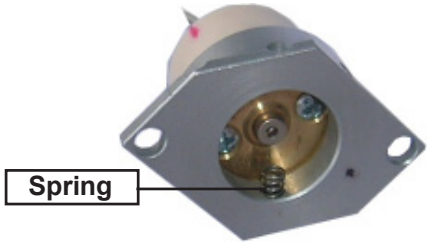
- Unplug the connector.

- Unscrew the 2 indicated screws.

- Take care to the spring placed inside when removing the aiming module from the optical block.







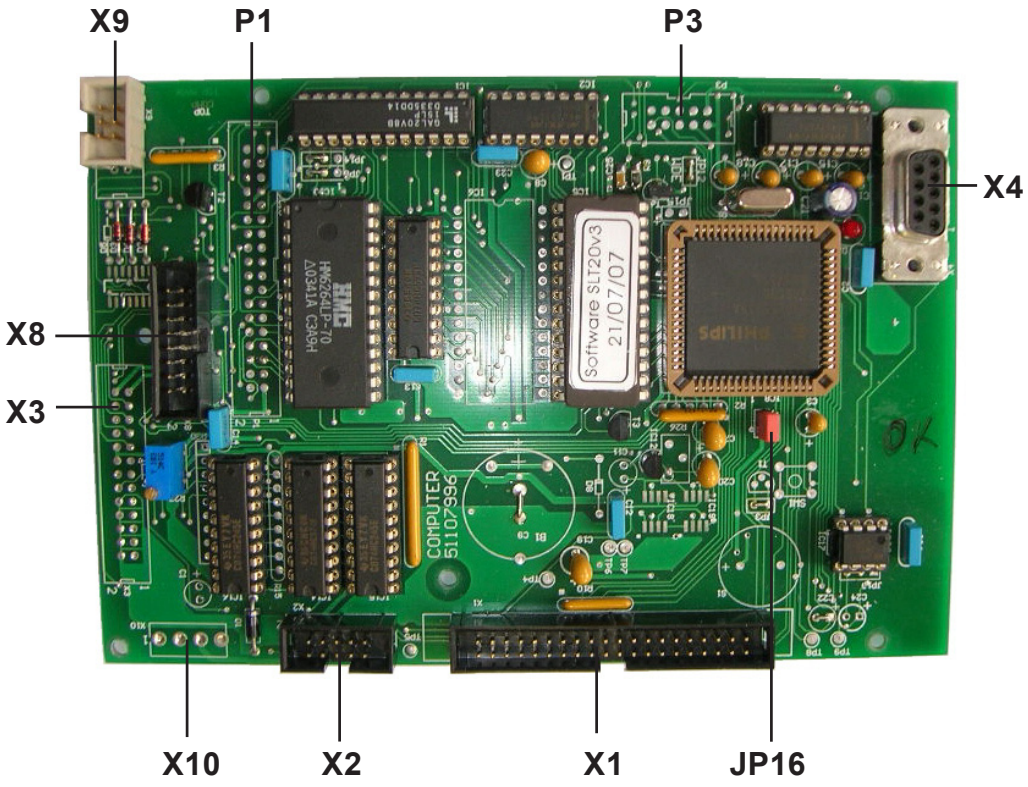
3 - SOLUTIS DISASSEMBLING

CHAPTER 4

LOCATION & CONNECTOR PINS DESCRIPTION

4 - LOCATION & CONNECTOR PINS DESCRIPTION

4-1 CPU BOARD (LASER CONSOLE)



4 - LOCATION & CONNECTOR PINS DESCRIPTION

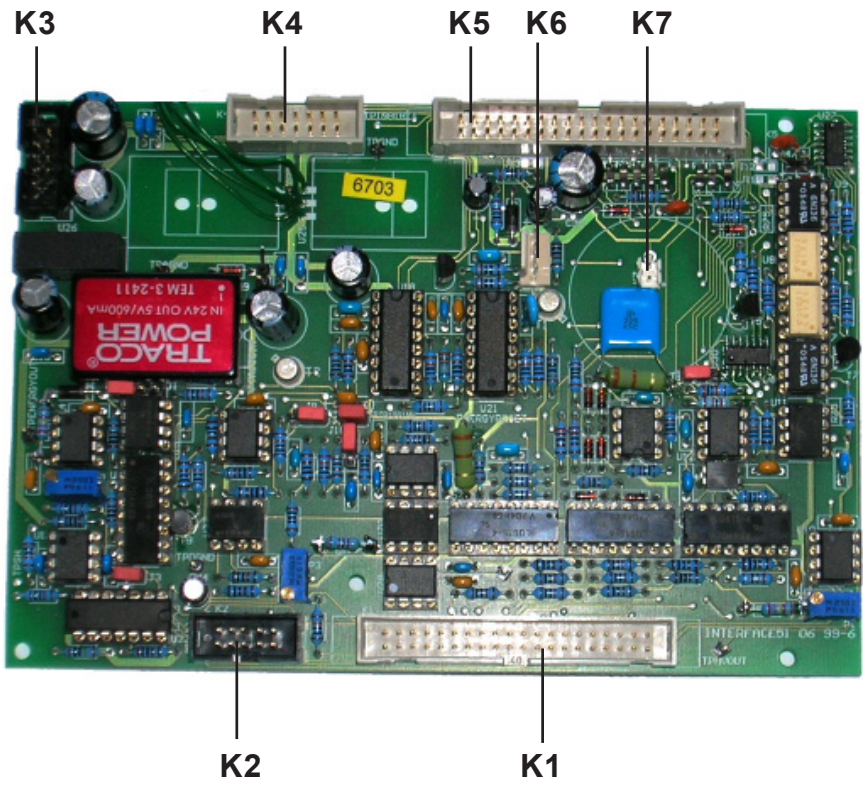
Connector	Pin	Signal
X1	1	OUT 1
	2	OUT 2
	3	OUT 3
	4	OUT 4
	5	OUT 5
	6	OUT 6
	7	OUT 7
	8	OUT 8
	9	INP 1
	10	INP 2
	11	INP 3
	12	INP 4
	13	INP 5
	14	INP 6
	15	INP 7
	16	INP 8
	17	P54
	18	P53
	19	P52
	20	P51
	21	P50
	22	DA 1
	23	DA2
	24	Gnd A
	25	P40
	26	P46
	27	P41
	28	P45
	29	P11
	30	P12
	31	P10
	32-37-40	Gnd
	33	P16
	34	P17
	35	PWM0
	36	PWM1
	38	WD
	39	PFAIL
P3	1	Gnd
	2	Vcc
	3	RXD
	4	TXD
	5	INT0
	6	INT1
	7	T0
	8	T1
	9	WR
	10	RD

Connector	Pin	Signal
X2 PWR-SUPPLY	1-3	Vcc
	2-4	Gnd
	5	+12V
	6	Gnd A
	7-9	PWR
	10	Earth
X3 PLASMA	1	D0
	2-4-6-8-10-14-16--18-20-22-26	Gnd
	3	D1
	5	D2
	7	D3
	9	D4
	11	D5
	12-25	Vcc
	13	D6
	15	D7
	17	WP
	19	ELSEL
	21	BO
	23	RESET
	24	BUSY
X4	1-4-6-9	NC
	2	Tx
	3	Rx
	5	Gnd
	7	RTS
	8	CTS
X8 LCD-DISPLAY	1-15	Gnd
	2-16	Vcc
	3	VEE
	4	A8
	5	A9
	6	LCD
	7	D0
	8	D1
	9	D2
	10	D3
	11	D4
	12	D5
	13	D6
	14	D7
JP16	IN	Service mode
	OUT	Doctor mode

Connector	Pin	Signal
X9 KEYBOARD	1	P57
	2	P56
	3	P55
	4	K0
	5	K1
	6	K2
	7	K3
	8-9-10	NC
X10 PLASMA-PWR	1	PWR
	2-3	Earth
	4	NC
P1	1-36	Vcc
	2-28-29-35	Gnd
	3	D0
	4	D1
	5	D2
	6	D3
	7	D4
	8	D5
	9	D6
	10	D7
	11	ALE
	12	PSEN
	13	INT0
	14	INT1
	15	CS-REZ
	16	P46
	17	P47
	18	P10
	19	A8
	20	A9
	21	A10
	22	A11
	23	A12
	24	A13
	25	A14
	26	A15
	27	P51
	30	WR
	31	RD
	32	RST
	33	P16
	34	P17

4 - LOCATION & CONNECTOR PINS DESCRIPTION

4-2 INTERFACE BOARD (LASER CONSOLE)



4 - LOCATION & CONNECTOR PINS DESCRIPTION

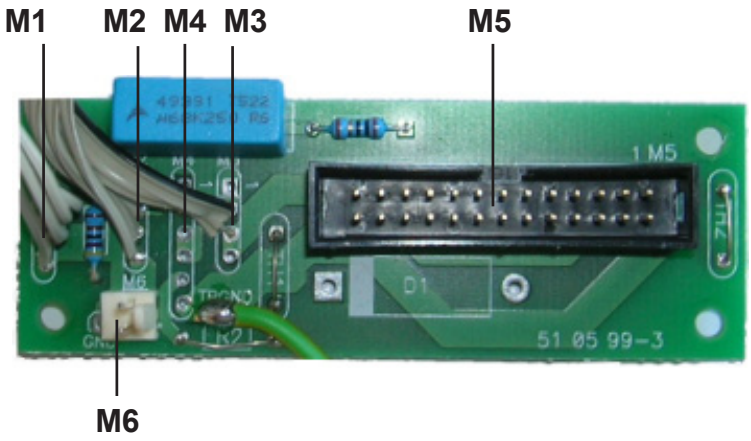
Connector	Pin	Signal
K1 CPU IN/OUT	1	PS INHIBIT in
	2	LED in
	3	Gain in
	4	SHUTTER ON
	5	Trigger in
	9	SHNO Shutter out (normaly opened)
	10	SHNC Shutter out (normaly closed)
	11	Footswitch 1 out
	12	Footswitch 2 out
	13	Slit out
	14	Interlock out
	19	Filter out
	20	Energy out
	21	HV out
	25	UCALC
	26	1 PULSE in
	28	2 PULSE in
	30	System status
	31	INT
	33	SLC
	34	SDA
	36	Warning buzzer
	38	Error out
	24-32-37-40	Gnd
	4-6-7-8-15-18 - 22-23-35-39	NC

Connector	Pin	Signal
K2 CPU POWER	1-3-5	+5V
	2-4-6	Gnd
	7-8-9-10	NC
K3 POWER IN	1-3-5-7	Gnd in
	2-4-6-8	+24V in
	7-8	NC
	9	JOYSTICK 1
	10	JOYSTICK 2
K4 HV	1-2-13-14	+24V
	3	PS INHIBIT out
	4	1 PULSE out
	5	2 PULSE out
	6	
	7	HV in
	8-9-10	Gnd
K6 LED	1	LED Gnd
	2	READY LED
	3	STANDBY LED
	4	LED +
K7 SPEAKER	1	EXT SPEAKER +
	2	EXT SPEAKER -

Connector	Pin	Signal
K5 OUTPUT	1	Footswitch +
	2	Footswitch 1
	3	Footswitch 2
	4-5-6-7	NC
	8-24	SCL SLAVE
	9-12-21	I2C +5V
	10	INTERUPT
	11-28	SDA SLAVE
	13-14-35-40	I2C Gnd
	15	TRIGGER Gnd
	16	TRIGGER PULSE
	17	INTERLOCK +
	18	ENERGY Vcc
	19	2POT
	20	ENERGY gnd
	22	SHUTTER +
	23	SHUTTER NC
	25	SH -
	26	SHUTTER NO
	27	SHUTTER -
	29	SLIT
	30	PILOT +
	31	INTERLOCK
	32	INTERLOCK Gnd
	33	PILOT -
	34	GAIN out
	36	ENERGY Gnd
	37	ENERGY in
	38	ENERGY +12V
	39	ENERGY RESET

4 - LOCATION & CONNECTOR PINS DESCRIPTION

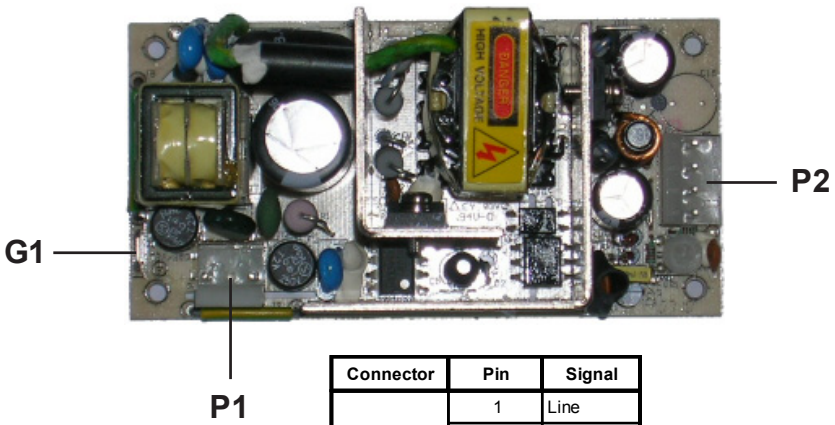
4-3 AUXILARY BOARD (LASER CONSOLE)



Connector	Pin	Signal
M1	1-2	+24V in
	3-4	Gnd in
M2	1	EMERGENCY in
	2	EMERGENCY out (+V)
	3	EMERGENCY in
	4	EMERGENCY out (Gnd)
M3	1-2	KEY in (+V)
	3-4	KEY out
M4	1-2	+24V
	3-4	+
	5	
	6	Gnd

Connector	Pin	Signal
M5	1-3-5-7-11-13--15-17-26	Gnd out
	2-4-6-8-12-14--16-18-19	+24V
	9-10-20-21	NC
	22-23	INTERLOCK out (+24V)
	24-25	INTERLOCK in
M6	1	LED +
	2	LED -

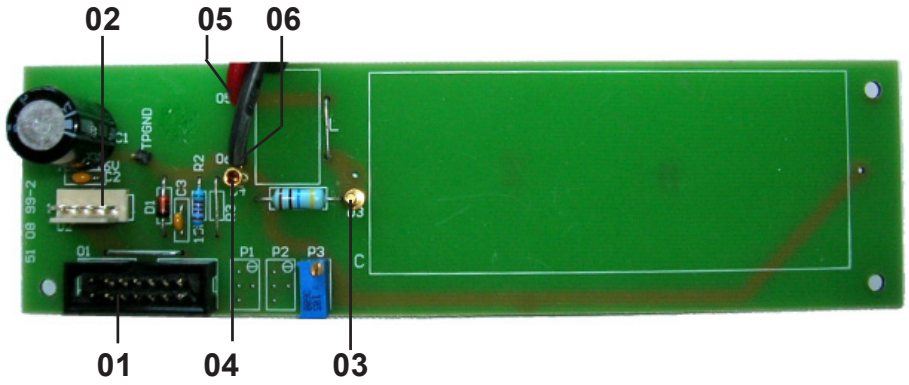
4-4 POWER SUPPLY (LASER CONSOLE)



Connector	Pin	Signal
P1	1	Line
	2	
	3	Neutral
G1	1	Earth
P2	1-2	+24V
	3-4	Gnd

4 - LOCATION & CONNECTOR PINS DESCRIPTION

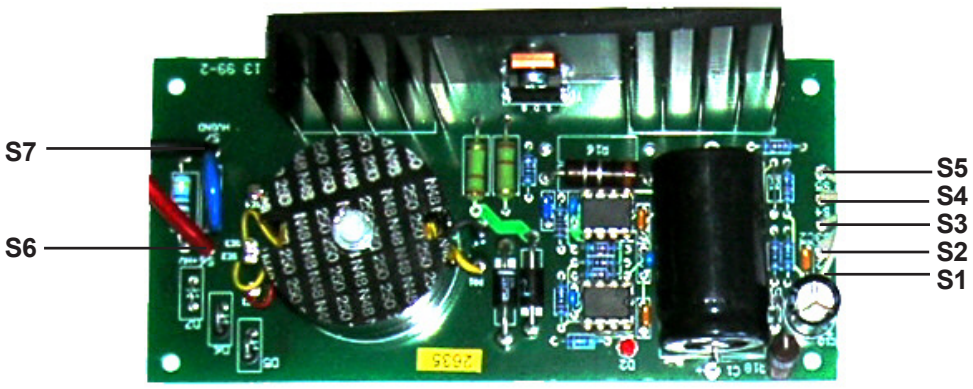
4-5 HV CAPACITOR CONTROLLER BOARD (LASER CONSOLE)



Connector	Pin	Signal
01	1-2-13-14	+24V in
	3	INHIBIT
	4	1 PULSE
	5	2 PULSE
	6	REF out
	7	HV in
	8-9-10-11-12	Gnd in
02	1	PWR in
	2	Gnd
	3	+ REF
	4	REF
	5	INH

Connector	Pin	Signal
03	1	HV
04	1	HV Gnd
05	1	HV +
06	1	HV Gnd

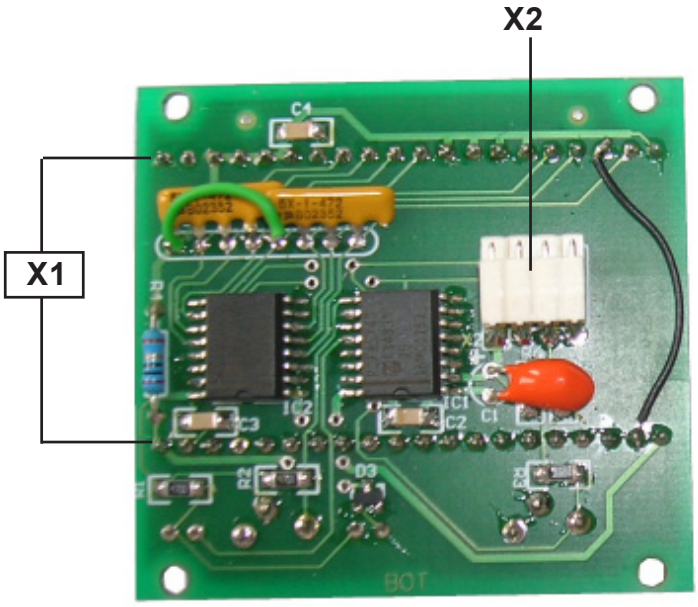
4-5 HV POWER SUPPLY BOARD (LASER CONSOLE)



Connector	Pin	Signal
S1	1	Power supply input (+24V)
S2	1	Power supply input (ground)
S3	1	Ref+
S4	1	Ref
S5	1	Inhibit
S6	1	High voltage out
S7	1	High voltage (ground)

4 - LOCATION & CONNECTOR PINS DESCRIPTION

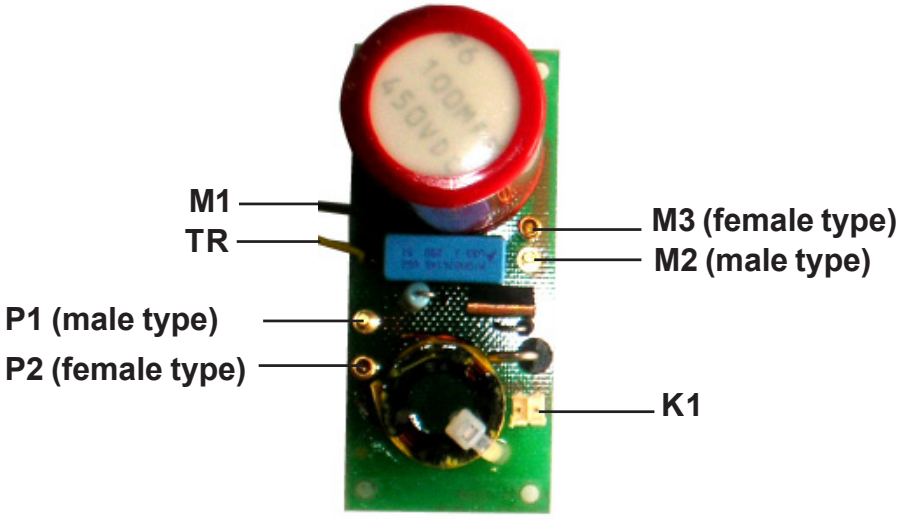
4-6 KEYBOARD/DISPLAY BOARD (LASER HEAD)



Connector	Pin	Signal
X1	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	

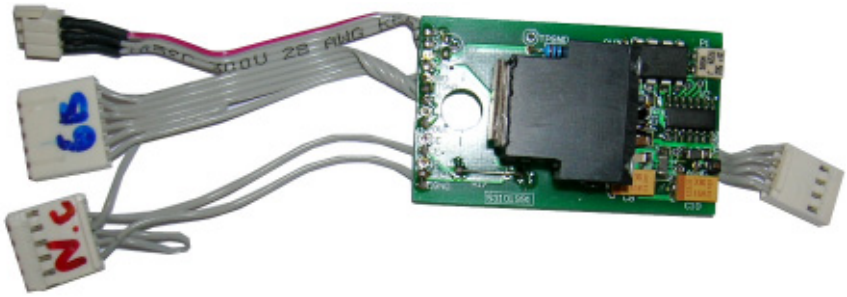
Connector	Pin	Signal
X2	1	+5V
	2	SDA
	3	SCL
	4	Gnd

4-7 TRIGGER BOARD (LASER HEAD)



Connector	Pin	Signal	Connector	Pin	Signal
K1	A	PLS	TR	1	TR1 P1
	B	PLS Gnd	M1	1	TR1 P2
P1	1		M2	1	Gnd
P2	1		M3	1	Gnd

4-8 ENERGYMETER BOARD (LASER HEAD)



Connector	Pin	Signal	Connector	Pin	Signal
H6A	1	+12	H6C	1	POT in
	2	A Gnd		2	POT- (Gnd)
	3	PLS		3	POT+ (24V)
	4	Out	H6F NOT CONNECTED	1	HEAT 2/1 (nc)
H6B	1	POT out		2	HEAT 2/2 (CE)
	2-3	+24V		3-4	HEAT 2/3
	4-5-6	Gnd			HEAT 2/4 (+24V)
				5	HEAT 2/5 (Gnd)

4 - LOCATION & CONNECTOR PINS DESCRIPTION

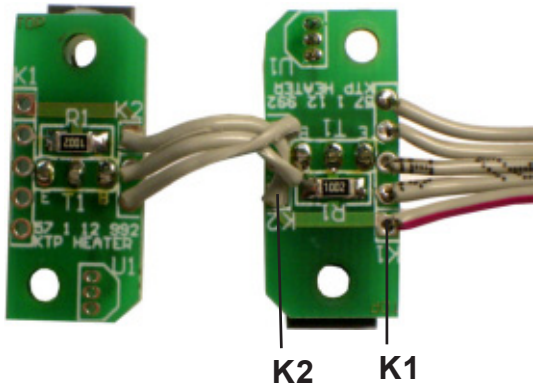
4-9 SHUTTER BOARD (LASER HEAD)

Connector	Pin	Signal
H4	1	SHUTTER +
	2	SHUTTER N.C.
	3	SH -
	4	SHUTTER N.O.
	5	SHUTTER -

4-10 AIMING BEAM BOARD (LASER HEAD)

Connector	Pin	Signal
S	1	+ 12V
	2	Gnd.
	3	POT +
	4	POT
	5	POT -

4-11 KTP HEATER BOARD (LASER HEAD)



Connector	Pin	Signal
K1	1	K2-1
	2	K2-2
	3	K2-3
	4	U1 cathode
	5	U1 anode

Connector	Pin	Signal
K2	1	K1-1
	2	K1-2
	3	K1-3

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Validated by : **P. QUERO**	